



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/032,156	12/21/2001	M. Amin Shokrollahi	019186-003800US	3575

20350 7590 10/24/2003

TOWNSEND AND TOWNSEND AND CREW, LLP
TWO EMBARCADERO CENTER
EIGHTH FLOOR
SAN FRANCISCO, CA 94111-3834

EXAMINER

FAN, CHIEH M

ART UNIT	PAPER NUMBER
----------	--------------

2634

DATE MAILED: 10/24/2003

9

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/032,156

Applicant(s)

SHOKROLLAHI ET AL.

Examiner

Chieh M Fan

Art Unit

2634

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 04 August 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-53 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 36-49 and 51-53 is/are allowed.
- 6) ☒ Claim(s) 1-8, 15-17, 26-30, 32, 33 and 50 is/are rejected.
- 7) ☒ Claim(s) 9-14, 18-25, 31, 34, 35 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 04 August 2003 is: a) ☐ approved b) ☒ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s). _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ | 6) <input type="checkbox"/> Other: |

DETAILED ACTION

1. Currently, there are fifty-three claims pending in the present application. However, the amendment filed 8/4/03 only listed claims 1-50. The applicants are reminded to present the entire set of claims in the next communication. Further, the examiner noticed that the independent claims in amendment are listed as "original", but are different from the original independent claims of the present application. However, it is determined that the new independent claims do not change the scope of the original independent claims. Based on the prior art rejections made in the previous Office Action, the following final rejection is presented.

Response to Arguments

2. Applicant's arguments filed 8/4/03 have been fully considered but they are not persuasive.

a. Regarding claim 1, the applicants argue that the number of possible output symbols of the convolutional encoder 28 of Wolf is not much larger than the number of the input symbols of the convolutional encoder (see lines 13-20 on page 17 of the amendment).

Examiner's response --- The applicants are reminded that the examiner is entitled to give the broadest reasonable interpretation to the language of the claims. The examiner is not limited to the applicant's definition which is not specifically set forth in the claims.

See *In re Tanaka et al.*, 193 USPQ 139, (CCPA) 1977. Wolf teaches a convolutional encoder that encodes each input bit into N bits (col. 6, lines 47-48). As shown in Fig. 2 of Wolf, the convolutional encoder 28 receives data from the RS encoder 24. In one embodiment, Wolf shows the RS encoder outputs 14-bit data (Fig. 4). The number of input symbols is therefore at most 2^{14} , and the number of the possible output symbols of the convolutional encoder is $2^{14 \times N}$. Since N is obviously at least two, the number of possible output symbols is at least 2^{28} . To the examiner, 2^{28} is much larger than 2^{14} even when N is equal to its smallest value, i.e., 2.

b. Regarding claim 1, the applicants also argue, "(a)s explained in the specification, in one embodiment, a dynamic encoder generates output symbols and can generate a stream of output symbols that is not limited by some rate that determines the number of possible output symbols for a set of input symbols." (See lines 21-28 on page 17 of the amendment)

Examiner's response --- In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the dynamic encoder generates a stream of output symbols that is not limited by some rate that determines the number of possible output symbols for a set of input symbols) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

c. Regarding claim 27, the applicants made similar argument with claim 1 (see page 18 of the amendment). The examiner's response with respect to claim 1 above is also applied to claim 27.

d. Regarding claim 50, the applicants made similar argument with claim 1 (see page 18 of the amendment). The examiner's response with respect to claim 1 above is also applied to claim 50.

Drawings

3. The proposed drawing correction and/or the proposed substitute sheets of the drawings, filed 8/4/03 have been disapproved.

The applicants submit a substitute Figure 12, which adds the block 1835. However, according to the last two lines in Paragraph 141 of the specification (see page 5 of the amendment filed 8/4/03), it appears that the step 1835 should be shown in Fig. 20 (emphasis added).

Claim Objections

4. Claims 27-35 and 50 are objected to because of the following informalities:

Regarding claims 27-35, "output symbol is generated from more than symbol" in line 12 should be changed to --- output symbol is generated from more than one symbol ---.

Regarding claim 50, "and the redundant symbols" in line 4 should be changed to --- and redundant symbols ---.

Appropriate correction is required.

Claim Rejections - 35 USC § 102

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. Claims 1-3, 6, 7, 26, 27, 30, 32 and 50 are rejected under 35 U.S.C. 102(b) as being anticipated by Wolf (U.S. Patent No. 5,983,383).

Regarding claim 1, Wolf teaches a method of encoding data for transmission from a source to a destination over a communications channel, the method comprising:

arranging data to be transmitted into an ordered set of input symbols (2, 36 in Fig. 2);

generating a plurality of redundant symbols from an ordered set of input symbols to be transmitted (see 24 and 36 in Fig. 2); and

generating a plurality of output symbols from a combined set of symbols including the input symbols and the redundant symbols (28, 30 in Fig. 2), wherein the number of possible output symbols is much larger than the number of symbols in the combined set of symbols (28 in Fig. 2 is a convolutional encoder which adds redundant

bits, the number of possible output symbols of 28 is therefore larger than the input symbols) wherein at least one output symbol is generated from more than one symbol in the combined set of symbols and from less than all of the symbols in the combined set of symbols (28 in Fig. 2 receives data from the 1st interleave 26, which interleaves more than one input symbol and one redundant symbols), such that the ordered set of input symbols can be regenerated to a desired degree of accuracy from any N the output symbols (108, 110, 112 in Fig. 5; as shown in Fig. 5, the viterbi decoder 108 receives the output symbols from the 1st de-interleaver 106, which in turn receives a plurality of output symbols in order to de-interleave).

Regarding claim 2, the plurality of output symbols of Wolf are transmitted over a communication channel (10, 12 in Fig. 1).

Regarding claim 3, Wolf teaches that the output symbols are stored in the interleaver 30 in Fig. 2 (an interleaver stores its input data in rows and reads out the data in columns, see col. 6, lines 40-42).

Regarding claims 6 and 7, as shown in Fig. 4 of Wolf, the number R of the redundant (i.e., parity) symbols varies according to the number K of input (i.e., information) symbols. The number K is variable, and is determined by a control processor (col. 6, lines 33-38 and 62-65).

Regarding claim 26, Wolf teaches that the step of generating the plurality of output symbols is performed using a convolutional encoder 28 (i.e., first device), and the step of generating a plurality of redundant symbols is performed by a Reed-Solomon encoder 24 (i.e., second device) separated from the convolutional encoder.

Regarding claim 27, Wolf teaches a system of encoding data for transmission from a source to a destination over a communications channel, the system comprising:

A static encoder (24 in Fig. 2) coupled to receive a plurality of input symbols, the plurality of input symbols generated from data to be transmitted (2 in Fig. 2), the static encoder (24 in Fig. 2) including a redundant symbols generator that generates a plurality of redundant symbols based on the input symbols (24 in Fig. 2 is a Reed Solomon encoder, which generates a plurality of redundant symbols, i.e., parity, based on the input symbols); and

A dynamic encoder (28, 30 in Fig. 2) coupled to receive the plurality of input symbols and the plurality of redundant symbols, the dynamic encoder including an output symbol generator that generates a plurality of output symbols from a combined set of symbols including the input symbols and the redundant symbols, wherein the number of possible output symbols is much larger than the number of symbols in the combined set of symbols (28 in Fig. 2 is a convolutional encoder which adds redundant bits, the number of possible output symbols of 28 is therefore larger than the input symbols) wherein at least one output symbol is generated from more than one symbol in the combined set of symbols and from less than all of the symbols in the combined set of symbols (28 in Fig. 2 receives data from the 1st interleave 26, which interleaves more than one input symbol and one redundant symbols), such that the ordered set of input symbols can be regenerated to a desired degree of accuracy from any N the output symbols (108, 110, 112 in Fig. 5; as shown in Fig. 5, the viterbi decoder 108

receives the output symbols from the 1st de-interleaver 106, which in turn receives a plurality of output symbols in order to de-interleave).

Regarding claim 30, Wolf also teaches a transmit module (32 in Fig. 2) coupled to the dynamic encoder (28, 30 in Fig. 2).

Regarding claim 32, Wolf also teaches a key generator ("code rate select" in Fig. 3) for the static encoder 924 in Fig. 2).

Regarding claim 50, Wolf teaches a computer data signal embodied in a carrier wave comprising:

A plurality of output symbols (output of 28 in Fig. 2), wherein the plurality of output symbols represents symbols generated from a combined set of symbols including an ordered set of input symbols (2 in Fig. 2) and redundant symbols (24 in Fig. 2), wherein the redundant symbols are generated from the input symbols (24 in Fig. 2 is a Reed Solomon encoder, which generates a plurality of redundant symbols, i.e., parity, based on the input symbols), wherein the number of possible output symbols is much larger than the number of symbols in the combined set of symbols (28 in Fig. 2 is a convolutional encoder which adds redundant bits, the number of possible output symbols of 28 is therefore larger than the input symbols), wherein at least one output symbol is generated from more than one symbol in the combined set and from less than all of the symbols in the combined set of symbols (28 in Fig. 2 receives data from the 1st interleaver 26, which interleaves more than one input symbol and one redundant symbols); such that a receiver of the data signal can regenerate the ordered set of input symbols to a desired degree of accuracy from any N of the output symbols (108, 110,

112 in Fig. 5; as shown in Fig. 5, the viterbi decoder 108 receives the output symbols from the 1st de-interleaver 106, which in turn receives a plurality of output symbols in order to de-interleave).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 4, 5, 15-17, 28 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolf (US Patent 5,983,383).

Regarding claims 4, 5, 28 and 29, Wolf teaches the claimed invention (see the rationale applied to claims 1 and 27 above), but does not specify whether the N is greater or less than the number of input symbols in the ordered set of input symbols. However, since both situations are claimed in claims, the claimed limitations appear to be only design options, dictated by the system requirement and the user's need. The number of the input symbols depends on the amount of information to be transmitted and the number N depends on the degree of interleaving in the interleaver of West. Both numbers clearly may be selected according to the system's requirement and the user's need and do not impact the operation of Wolf.

Regarding 15-17, claims 15-17 are directed to "the desired accuracy", which is only a matter of design choice depending on the user's need. The desired accuracy only changes the process of recovering the data according to the user's need at the receiving end. It will not change the operation of West's method of encoding data for transmission, which is performed at the transmitting end. It would have been obvious to a user to select any desired accuracy to meet the user's need.

9. Claims 8 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wolf (US Patent 5,983,383) in view of Dillon et al. (US Patent 6,430,233).

Wolf teaches the claimed invention, see the rationale applied to claims 1 and 27 above, but fails to teach that the plurality of redundant symbols is generated according to a LDPC code (Wolf teaches the plurality of redundant symbols is generated according to a Reed-Solomon code). However, both LDPC code and Reed-Solomon are well known and widely used in the art for forward error correction. Dillon et al. teaches using a LDPC code or Reed-Solomon code as an error correction code (claim 47). Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to generate the plurality of redundant symbols is generated according to a LDPC code so as to improve the reliability of communication.

Allowable Subject Matter

10. Claims 36-49 and 51-53 allowed.

Claims 9-14, 18-25, 31, 34 and 35 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

11. The following is a statement of reasons for the indication of allowable subject matter:

Claims 36-44 and 51-53 are allowable over the prior art of record because the prior art of record does not teach or suggest the limitation "if the step of regenerating at least a subset of the symbols from the N output symbols does not regenerate the input symbols to a desired degree of accuracy, regenerating at least some of un-regenerated input symbols from the plurality of regenerated redundant symbols and the plurality of regenerated input symbols".

Claims 45-49 are allowable over the prior art of record because the prior art of record does not teach or suggest a dynamic decoder that, upon receiving at least a subset of the output symbols, decodes a subset of the symbols in the combined set from the output symbols, the subset of the symbols in the combined set including a plurality of decoded input symbols and a plurality of decoded redundant symbols, and a static decoder that decodes at least some of undecoded input symbols, if any, from the plurality of decoded redundant symbols.

Claims 9-14, 34 and 35 are allowable because the prior art does not teach or fairly suggest the steps of generating the plurality of first redundant symbols from the input symbols and generating the plurality of redundant symbols from the first redundant

symbols and the input symbols.

Claims 18 is allowable because the prior art does not teach or fairly suggest at most G input symbols can be regenerated from any number of output symbols, wherein G is less than the number of input symbols in the ordered set of input symbols.

Claims 19-22 are allowable over the prior art of record because the prior art of record does not teach or suggest the steps of "determining t distinct input symbols according to a distribution; and computing each redundant symbol as the XOR of the t distinct input symbols.

Claim 23-25 are allowable over the prior art of record because the prior art of record does not teach or suggest that the steps of generating the plurality of output symbols is performed substantially concurrently with the step of transmitting the plurality of output symbols.

Claim 31 are allowable because the prior art does not teach or fairly suggest a key generator, coupled to the dynamic encoder, that generates a key for each output symbol to be generated, wherein the dynamic encoder is coupled to receive each key, and wherein the dynamic encoder generates each output symbol based on the corresponding key.

Conclusion

12. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chieh M Fan whose telephone number is (703) 305-0198. The examiner can normally be reached on Monday-Friday 8:00AM-5:30PM, Alternate Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephen Chin can be reached on (703) 305-4714. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9314 for regular communications and (703) 872-9314 for After Final communications.

Art Unit: 2634

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 305-4750.



Chieh M Fan
Primary Examiner
Art Unit 2634

cmf
October 19, 2003